ORIENTATION DEPENDENCE OF A DISLOCATION ETCH FOR ZINC*

K. H. Adams**, R. C. Blish, and T. Vreeland, Jr.
W. M. Keck Laboratory of Engineering Materials
Pasadena, California

The dislocation etch for $(10\bar{1}0)$ surfaces of zinc reported by Brandt, Adams, and Vreeland[1,2] has been further explored. Additional surface orientations have been found where dislocation etching takes place. These orientations cover an area located between 3° and 12.2° to the $[0001]$ and the area is symmetric about that axis. Attempts to produce dislocation etching on surfaces within 2° of (0001) were generally unsuccessful. This is in contrast with the etching of many crystals which takes place only within a few degrees of a low index plane.

The crystallographic surfaces on which good and marginal dislocation etching is observed are shown on a segment of a sphere in Fig. 1. Good etching of surfaces near $(10\bar{1}0)$ extends 25° from the $[10\bar{1}0]$ toward $[0001]$, and 5° toward $[01\bar{1}0]$.

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** Present Address: Engineering Department, Arizona State University, Tempe, Arizona.

[1] Brandt, et. al., J. Appl. Phys. 34, 587 (1963).

[2] Brandt, et. al., J. Appl. Phys. 34, 591 (1963).

The appearance of an etched surface whose normal is 10° from the $[0001]$ and 80° from the $[\bar{1}2\bar{1}0]$ is shown in Fig. 2. The surface was intentionally damaged with two razor blade scratches. The trace of (0001) planes on the surface is indicated, and dislocations are revealed lined-up in the general direction of the $\{1\bar{2}12\}$ second order pyramidal slip plane traces (indicated by the dashed lines). The dark lines eminating from the scratches are twins.

Etched $(10\bar{1}0)$ and $(\bar{1}01\ 24)$ surfaces of a crystal which has been pulse loaded in $[\bar{1}2\bar{1}0]$ compression are shown in Fig. 3. The $(\bar{1}01\ 24)$ surface is about 5° from (0001). Dislocations in the $\{1\bar{2}12\}\langle\bar{1}2\bar{1}3\rangle$ slip bands formed by the pulse load which intersect the $(10\bar{1}0)$ surface are predominantly of edge orientation while those intersecting $(\bar{1}01\ 24)$ are predominantly of screw orientation.

We conclude that dislocations of the $\{1\bar{2}12\}\langle\bar{1}2\bar{1}3\rangle$ slip system are revealed on etched surfaces near (0001) as well as on surfaces near $\{10\bar{1}0\}$. It has been demonstrated[2] that both edge and screw oriented dislocations on the basal $(0001)\langle\bar{1}2\bar{1}0\rangle$ slip system are revealed on surfaces near $\{10\bar{1}0\}$. The failure of the etch to reveal dislocations on surfaces within 2° of (0001) is not understood.

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Figure Captions

1. Surfaces on which good, marginal, and poor etching is observed.

2. A scratched and etched surface whose normal is 10° from [0001] and 80° from $[\bar{1}2\bar{1}0]$.

3. Slip bands on the $\{1\bar{2}12\}\langle 1\bar{2}1\bar{3}\rangle$ system of zinc which formed during a stress pulse, 425 psi (resolved), 17 msec duration, as revealed by etching. The $[1\bar{2}10]$ compression axis is vertical.
   (a) $(10\bar{1}0)$ surface.
   (b) $(\bar{1}01\ 24)$ surface.